

CHAPTER 7

Back Pain

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Low back pain (LBP) is one of the most common complaints seen in the family medicine practice. It is estimated that 70% to 80% of the population will suffer from this at some point in their lifetime. A detailed history and examination are essential to ascertain the etiology and diagnosis. Although we are able to determine some potential etiologies of back pain, often the actual causes of pain-producing components are unknown. Complicating this situation, multiple factors and triggers may exist in an anatomically normal back that may create pain. Conversely, anatomic abnormalities, such as the presence of herniated disks have been demonstrated in asymptomatic individuals.

In some cases, back pain can represent a life-threatening emergency. A history of bony point tenderness raises the concern for infection or fracture. Associated abdominal pain or unexplained pain in older patients could represent an aortic aneurysm. It remains critical for the family physician to recognize situations requiring a more detailed workup and treatment. The most common etiology, mechanical (myofascial) back pain, can typically be treated conservatively without imaging, hospitalization, surgery, or strict activity restrictions.

Aortic aneurysm: Abdominal aortic aneurysms can present as back pain (see Chapter 1).

Osteomyelitis of the lumbosacral spine can present as back pain. This condition typically presents with local signs of inflammation and infection. Osteomyelitis of the lumbosacral spine often occurs because an infected skin wound or superficial infection in the area of the lumbosacral spine extends deeper and involves the bones of the spinal cord.

Epidural abscess can present as back pain. An epidural abscess in the area of the lumbosacral spine typically presents with systemic findings such as fever and malaise in addition to the back pain. In cases of epidural abscess there are usually predisposing factors, such as immune deficiency, or instrumentation of the epidural space, either for diagnostic or therapeutic reasons.

HERNIATED LUMBAR DISK

A herniated lumbar disk (sometimes called a ruptured disk) is different from a bulging disk or protrusion. It occurs when the gel-like center of a disk actually ruptures out through a tear in the tough

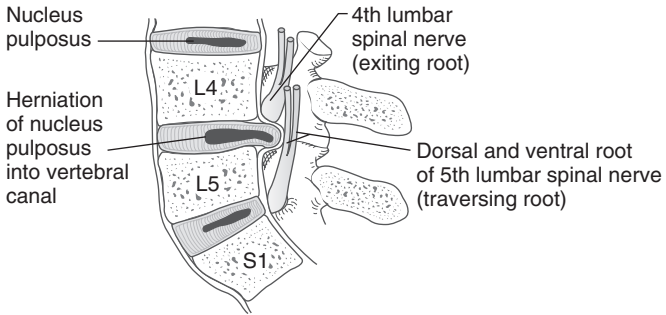


FIGURE 7-1 Herniated lumbar intervertebral disk. Herniation occurs posterolaterally and affects traversing root, not exiting root, i.e., herniation at L4-L5 affects L5 root, whereas herniation at L5-S1 affects S1 root. (From Moore NA, Roy WA: Rapid review gross and developmental anatomy, 3rd ed, Philadelphia, 2011, Elsevier.)

disk wall (annulus) (Fig. 7-1). The gel material is irritating to the spinal nerves, causing something like a chemical irritation. The pain is believed to be a result of spinal nerve inflammation and swelling caused by pressure of the herniated disk. Usually, disks herniate because of injury or improper lifting, but aging also contributes. Herniated disks are most common in people in their 30s and 40s.

Each disk has two parts, the nucleus pulposus (the inner, central, soft part of the intervertebral disk) and the annulus fibrosis (the thick, outer part). As the nucleus pulposus loses its turgor and the elasticity of the annulus diminishes, the disk bulges outward beyond the vertebral body margins. A herniated nucleus pulposus (HNP) through an annular defect causes focal protrusion of the disk material beyond the margins of the adjacent vertebral endplate, resulting in disk herniation.

Trauma is the single most common cause of rupture of the nucleus pulposus through the annulus fibrosis resulting in protrusion or extrusion of the disk material into the vertebral canal. This outcome can be due to a single event or repeated trauma. The injury most often occurs on the posterior or posterolateral aspect of the disk (Table 7-1). Other potentiating factors include age, apoptosis, abnormalities in collagen, vascular ingrowth, loads placed on the disk, abnormal proteoglycan, obesity, sedentary lifestyle, and poor physical fitness. Although a commonly suspected cause of LBP, herniated disks represent only 4% of cases of LBP.

Symptoms

- Sciatica (pain radiating below the knee) +++++
- Sharp, burning, or stabbing pain that radiates from the lower back area, down one or both legs +++++
- Pain like an electrical shock that is severe with standing, walking, or sitting +++++

Table 7-1. Location of Pain and Motor Deficit in Association with Nerve Root Involvement

DISK LEVEL	LOCATION OF PAIN	MOTOR DEFICIT
T12–L1	Pain in the inguinal region and medial thigh	None
L1–L2	Pain in anterior and medial aspect of upper thigh	Slight weakness in quadriceps; slight diminished suprapatellar reflex
L2–L3	Pain in anterolateral thigh	Weakened quadriceps; diminished patellar or suprapatellar reflex
L3–L4	Pain in posterolateral thigh and anterolateral tibial area	Weakened quadriceps; diminished patellar reflex
L4–L5	Pain in dorsum of foot	Extensor weakness of big toe and foot
L5–S1	Pain in lateral aspect of foot	Diminished or absent Achilles reflex

- Activity such as bending, lifting, twisting, and stooping increases the pain +++
- Lying supine may be the only relief ++
- Muscle spasms in the back or leg ++
- Cauda equina syndrome produces symptoms requiring immediate referral to a specialist to prevent permanent damage.
 - Leg muscle weakness +++
 - Knee or ankle reflex loss +++
 - Footdrop +++
 - Loss of bowel and bladder function ++

Signs

- Straight-leg test is positive in patients with herniated lumbar disks ++++
- When in doubt of authenticity of symptoms, the distracted (seated) straight-leg test should be performed.
- Crossed straight-leg raise (reproduction of pain on the affected side, while raising the contralateral leg) (most specific test) +++
- Weak ankle dorsiflexion or ankle reflex +++
- Leg sensory abnormality ++

Workup

- Emergent MRI of the spine (lumbosacral, thoracic, or cervical images) in severe cases in which cauda equina or cord impingement is of concern
- MRI may be considered after failure of 6-week trial of conservative treatment or for severe or progressive neurologic deficits (the

high rate of disk abnormalities in asymptomatic patients require appropriate selection and clinical correlation of MRI findings.

- X-ray in person older than age 50 with or without history of mechanical cause to rule out metastatic disease or compression fracture as cause of symptoms
- EMG may help to correlate the disk herniation to the nerve affected, but is rarely done.
- Bone scan is an option to evaluate for bony abnormality but has been largely replaced in most cases by MRI.
- CT scan of the spine (lumbosacral, thoracic, or cervical images) if concern for fracture
- Myelography with CT scanning is indicated when MRI is not possible (i.e., hardware in patient such as pacemaker) or when surgery is contemplated in cases of:
 - Spinal stenosis
 - Lateral recess stenosis
 - Multiple abnormal disks
 - Spondylolisthesis
 - Possible neoplasm
 - After severe trauma

Comments and Treatment Considerations

In the absence of red flags, patients should be treated conservatively. Approximately 90% of cases improve within 6 weeks and progress to symptom resolution within 12 weeks. Recommending bed rest shows no benefit and may actually delay recovery.

Aerobic exercise and physical therapy strengthening of abdominal and back muscles can relieve symptoms of radicular pain, but have limited supporting evidence. Exercise and massage techniques are easily taught to patients and family members. Extension and isometric exercises are performed first and after sufficient strength and pain relief, flexion exercises are allowed. Exercise may be beneficial for prevention of recurrence. Ultrasound, transcutaneous electrical nerve stimulation (TENS), and acupuncture/massage are of limited value for pain control only.



MEDICATIONS—NSAIDS, ANALGESICS, STEROIDS

In patients with nonspecific LBP, NSAIDs, acetaminophen and muscle relaxers may be effective based on systematic reviews and RCTs, but lack specific studies for lumbar disk herniation. NSAIDs reduce inflammation and alleviate pain, but clinical evidence shows NSAIDs to be no different than placebo based on one systematic review in treating sciatica pain associated with herniated lumbar disk. Tramadol and opioid analgesics are effective for moderate to severe pain, but have not been studied specifically for disk herniation. Nortriptyline and amitriptyline are often recommended for neuropathic pain, but lack specific evidence in disk herniation. Systemic steroids are no better than placebo for the treatment of lumbar disk herniation pain studied using consistent RCTs.

Trigger point injections—1 to 2 mL of 1% lidocaine without epinephrine—can be administered to provide extended relief for localized pain sources (trigger points). Epidural steroid injections are often considered. One systematic review demonstrated limited evidence that epidural corticosteroid injections increased global improvement compared with placebo. RCTs following this initial study showed no significant difference between epidural corticosteroid injections plus conservative treatment and conservative treatment alone. It may modestly improve pain in the short term but has no effect on the long-term outcomes.

Spinal manipulation is controversial, but may warrant consideration as a recent study demonstrated pain improvement (see [“Mechanical Back Pain”](#)).

Surgical intervention has been controversial. Studies have had limitations in study design. Patients who have microdiscectomies have faster improvements than patients receiving conservative treatment, but long-term improvement rates in both groups are similar.

Surgical indications include:

- Cauda equina syndrome
- Progressive neurologic deficit
- Profound neurologic deficit
- Severe and disabling pain refractory to 4 to 6 weeks of conservative treatment

In the absence of these “red flags,” systematic reviews show conservative management is appropriate for up to 6 weeks prior to obtaining imaging or considering surgical approaches.

MECHANICAL BACK PAIN

Back pain is the second most common presenting complaint in the United States. Mechanical back pain is most commonly attributed to acute trauma or injury from overuse. The mechanism of injury is frequently twisting of the back while lifting a heavy object. Injury may also result from motor vehicle accidents, prolonged sitting, or falls. Mechanical back pain often results from lumbar strain or sprain, disk herniation, spinal stenosis, degeneration (osteoarthritis), or fractures either due to trauma or compression. Muscle spasms are the result of protective muscle splinting following joint or soft tissue disease or injury, and may be another source for LBP. Acute trauma or repetitive microtrauma may lead to the formation of trigger points and can also cause LBP.

Although the precise etiology for back pain is often difficult to establish, it is widely assumed that nonradiating LBP is secondary to musculoligamentous injury, degenerative changes in the spine, or both. Tenderness of the bony spine itself should raise concern for non-soft tissue (and potentially emergent) diagnoses. The etiology of LBP is mechanical in 97% of cases.



RISK FACTORS FOR MECHANICAL BACK PAIN

- Heavy physical work, heavy lifting, twisting, vibration, and posture ++
- Increasing age +
- Work dissatisfaction and monotonous work +
- Depression +
- Smoking, drug use +
- Obesity +
- Severe scoliosis ++
- Extremes of physical fitness ++

Symptoms

- History of trauma or injury ++++
- Pain at the site of injury or occasional radiation of pain to the legs ++++
- Stiffness +++
- Numbness, weakness, tingling at the site of pain or of extremity +++
- Position of pain reproduction (for nonradicular pain) may suggest etiology:
 - Flexion: interspinous ligament (sitting) +++
 - Extension: facet related (standing) +++
- Muscle spasm ++

Signs

- Swelling +
- Tenderness, warmth over musculature +
- Palpable mass, spasm ++
- Trigger points are focal, hyperirritable nodules located in a taut band of skeletal muscle that produce pain locally and in a referred pattern with palpation. +++
- Limited ROM due to pain +++
- Manual medicine clinicians commonly use the PART (Pain and Tenderness; Asymmetry; Range of motion abnormality; Tone, Texture, and Temperature abnormality) acronym to identify the categories of joint dysfunction. +++
- Motion between adjacent vertebrae to detect hypomobility with tenderness and pain +++
- Decreased sensation over site of injury ++
- Sciatic nerve and piriformis muscle tenderness may indicate piriformis syndrome. +++
- Supraspinous or interspinous ligament tenderness, due to injury or spondylolisthesis +++
- Stork test may indicate spondylolysis ++
- Gait: Antalgic to the ipsilateral side of spasm ++
- Patrick or flexion abduction external rotation (FABER) test to differentiate hip versus sacroiliac (SI) joint etiology of pain ++

Workup

- Consider nonmechanical conditions as a source of back pain such as malignancy, infection, and inflammatory conditions and aortic vascular disease (<5% of cases).
- Diagnosis is based mainly on history and physical examination, although testing is sometimes required to rule out emergent conditions.
- Mechanical LBP is difficult to diagnose due to the absence of any screening or confirmatory tests. As mentioned earlier, urinalysis, x-ray, CT, ultrasound, and MRI may occasionally be required to rule out more ominous causes of pain. A recent guideline advises against routine imaging for nonspecific LBP.
- MRI is indicated for severe or progressive neurologic deficits (should be ordered cautiously due to the high rate of disk abnormalities in asymptomatic patients).
- Patients with loss of bowel or bladder sphincter tone or progressive neurologic deficit from LBP should be appropriately referred for immediate aggressive treatment.
- Long-term management of patients with chronic back pain may be aided by MRI, though many patients without pain have findings and those with pain may have limited findings.

Comments and Treatment Recommendations

Approximately 90% of LBP cases improve within 4 to 6 weeks and spontaneously recover usually within 3 months. If pain persists or symptoms worsen, further workup may be necessary to evaluate for other causes. Follow-up examinations are recommended to provide education and psychologic support to patients. Because treating and reversing the causes of chronic pain can be challenging at best, treatment is directed to prevent transition from acute to chronic. Chronic pain treatment goals involve maximizing functional ability and limiting pain because these patients may never be completely pain free.

It is important to return to activities of daily living as soon as possible, and bed rest should be limited to 2 to 3 days even in severe cases. There is strong evidence to support limited best rest.

Ice is recommended for the first 24 to 48 hours along with pain medication. Heat can be applied after 48 hours to increase blood flow locally and decrease stiffness and spasms. The effectiveness of heat has been supported by recent literature. There is also some evidence to support the use of topical counterirritants for acute injury.

NSAIDs maybe useful for pain control and mobility. Acetaminophen may also be recommended for pain control because evidence for superiority for NSAIDs over acetaminophen is lacking. Short-term opiate analgesics should be considered if necessary in severe cases. Muscle relaxants can also be used to reduce spasms or for more severe pain, but their use may be limited by the drowsiness side effect.

Braces may offer support to the back and relieve pain. No strong evidence to support their use and concerns for potential muscle weakening should limit this as a treatment option.

Physical therapy has proven benefits. Therapists are able to provide further education, treatment modalities and address additional underlying physical confounders. Although preferred by many patients, strong evidence to support massage treatments is lacking.

Studies on manipulation have demonstrated some short-term benefit. Because an increasing number of patients and providers are using manipulation, a brief description is included in the following text. Manipulation is a high-velocity procedure that moves a joint past its passive range and into the end barrier. The ROM is increased and, unlike mobilization, the patient does not have control in cases with severe spasm. The provider instead has control over the joint and the patient. Therefore, only those skilled in manipulation should perform this procedure. The negative pressure created within the joint commonly produces a cracking sound, which allows for greater passive range of motion and gapping of the zygapophyseal/facet joint. Spinal manipulation has shown to be beneficial for acute and chronic pain. Patients treated with manipulation for LBP have been shown to use fewer overall number of treatments when compared with physical therapy alone. Other forms of manipulation use more traction forces in order to decrease diskal pressure or increase foraminal dimensions.



CONTRAINDICATIONS TO SPINAL MANIPULATION

- Cancer or other destructive lesions
- Severe osteopenia
- Active spondyloarthropathies
- Cauda equina symptoms

METASTATIC DISEASE TO THE SPINE

Metastatic spinal disease is 25 times more common than primary tumors. The most common tumors to metastasize to the spine include lymphoma, melanoma, and tumors of the breast, lung, prostate, kidney, and GI tract. Blood flows through the Batson plexus in the epidural space, which communicates with blood spaces in the vertebral marrow. Lung and breast metastases mostly affect the thoracic spine, whereas renal metastasis affects the lumbosacral spine. Although metastasis may compromise the vascular supply causing edema or ischemia, nerve tracts are vulnerable to compression. This includes the corticospinal and spinocerebellar tracts and the posterior spinal columns.

Symptoms

- Back pain is the presenting symptom in 90% of patients who have spinal metastasis; it tends to be worse when patients are supine and may awaken them during the night. ++++
- Fever, chills ++
- Weight loss +++

- Weakness in 75% of patients ++++
- Autonomic or sensory symptoms in 50% of patients +++
- More than 50% of patients have bowel and bladder dysfunction. +++

Signs

- Red flags: History of cancer, age less than 20 or more than 50 years, weight loss, or radiculopathy +++
- Spinal instability because the pain is mechanical in origin ++++
- In early diagnosis, patients are more likely to show flaccidity and hyporeflexia. ++
- In later diagnosis, spasticity and hyperreflexia are more common. +++

Workup

- Frequently, early metastasis is not visualized on plain radiographs.
- Positive findings when present can be osteoblastic or osteolytic or mixed changes on x-ray.
- The advantage of CT is its good anatomic resolution, soft-tissue contrast, and detailed morphology. Both cortical and trabecular bone components are well defined. The sensitivity of CT for detecting bone metastasis ranges between 71% and 100%. Because cortical destruction is required for visualization of a metastasis by CT, the sensitivity of this modality in detecting early malignant bone involvement is relatively low.
- Bone scans are positive in 85% of patients who have spinal metastasis.
- Technetium bone scan shows increased uptake. By injecting radioactive dye, the dye has a propensity to accumulate in damaged or cancerous bone areas that are detected by a scan. The bone scan is most helpful to rule out metastatic spread to bone, especially if new bone pain is noted and surgery is contemplated.
- Published sensitivity rates of bone scan in detecting bone metastases vary between 62% and 100% with a specificity of 78% to 100%.
- Repeat bone scans may be needed to help confirm if an area seen is actually cancer, or just an old area of trauma. A baseline bone scan, as is done with breast cancer, may be reasonable for reference to follow up bone scans.
- MRI is the most sensitive and specific modality for imaging spinal metastases.
- Paraspinal tumors that enter the epidural space through the neuroforamen result in back pain, and progressive neurologic symptoms are often unseen on bone scan but are typically detectable on MRI.
- MRI may identify spinal metastasis in patients who have normal radiographs and bone scans. MRI has a sensitivity ranging from 83% to 100%.
- MRI is mainly reserved for regional assessment of a bone lesion suggested by bone scan or CT.

Comments and Treatment Considerations

Treatment focuses on two aspects: treatment of the primary disease and symptomatic pain control. Symptomatic pain control is

typically conducted with opioids, chemotherapy, and radiotherapy. Radiotherapy remains the standard for spinal metastases due to myeloma, lymphoma, and many types of adenocarcinoma. Myelopathy, which occurs secondary to compression, can be pretreated with high-dose corticosteroids to decrease cord edema and alleviate pain. Radiation therapy is the standard approach for treatment.

Surgery is indicated for certain biopsies, treating mechanical instability, and decompressing the spinal cord in cases of bony impingement, failed radiotherapy, or tumors resistant to radiotherapy. Spinal cord compression (also discussed in this chapter) is also a serious complication.

VERTEBRAL COMPRESSION FRACTURE

Vertebral compression fracture is the most common complication of osteoporosis and the most common type of osteopathic fracture. There are about 500,000 new cases of vertebral fractures yearly in the United States and it is estimated to occur in 26% of women older than age 50 years. The prevalence of this condition increases with advancing age, reaching 40% in women 80 years of age. Acute fractures occur when the weight of the upper body exceeds the ability of the bone within the vertebral body to support the load. The risk factors are categorized as modifiable and nonmodifiable. Nonmodifiable factors include advanced age, female gender, white race, and presence of dementia. Modifiable factors are alcohol use, tobacco use, presence of osteoporosis, and estrogen deficiency.

Symptoms

- LBP, which can also occur in the upper back, abdomen, and thigh
+++++
- Paresthesias +++
- Bowel and bladder incontinence ++
- Kyphosis, lumbar lordosis +++
- Early satiety secondary to compressed abdominal organs +
- Weight loss ++

Workup

- Physical examination: Typically has tenderness directly over the area of the acute fracture, and commonly increased kyphosis is noted. In an uncomplicated fracture straight-leg raise is negative and the neurologic examination is normal.
- Plain radiographs: The recommended initial imaging study obtained, which may show the classic wedge-shaped vertebral body
- CT and MRI are used for evaluating the posterior vertebral wall integrity and for ruling out alternative causes of the back pain. MRI is also recommended when patients have suspected spinal cord compression or other neurologic symptoms.
- A nuclear medicine bone scan: Indicated when symptoms are atypical. It is also helpful in diagnosing sacral insufficiency fractures.

Comments and Treatment Considerations

Traditional treatments are nonoperative and conservative. Most patients can fully recover or show improvement from the fracture in about 6 to 12 weeks. Bed rest is indicated. Prolonged inactivity should be avoided.

Analgesics and NSAIDs offer pain relief. Use caution in older adults because of the risk of GI bleeding. Calcitonin-salmon nasal spray has also shown to be beneficial for pain. Prescribe a muscle relaxant for symptomatic relief of associated muscle spasms.

In addition to treating osteoporosis and thereby reducing the risk of fracture, bisphosphonates may be beneficial in treatment of fracture. In one study, alendronate was shown to reduce the number of days of bed disability and days of limited activity caused by back pain in postmenopausal women with preexisting vertebral fracture.

Physical therapy helps stabilize the spine and improves posture.

External back braces are uncomfortable and typically unnecessary for fractures with minimal compression.

Patients who do not respond to conservative treatment or continue to have severe pain are good candidates for percutaneous kyphoplasty or vertebroplasty. An ongoing multicenter randomized controlled trial is examining the outcomes from vertebroplasty versus kyphoplasty.

Preventive measures are the best way to avoid these fractures. These include a well-balanced diet, regular exercise, smoking cessation, appropriate calcium and vitamin D, and bisphosphonates (for osteopenia and osteoporosis).

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